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Biology, Princeton University.

There is no direct relationship between the extent of muscular activity and the rate of regeneration. In the absence of the influence of the sense-organs regeneration can take place normally but always at a decidedly lower rate.

15. *Heritable Variations and the Results of Selection in the Fission Rate of Stylonychia Pustulata*: AUSTIN RALPH MIDDLETON, Zoological Laboratory, Johns Hopkins University.

It is possible to give precise data as to the occurrence of heritable variations and their accumulation through selection: and this can hardly fail to have influence on the conception of the genotype as a fixed thing.

16. *Hereditary Anchylosis of the Proximal Phalangeal Joints (Symphalangism)*: HARVEY CUSHING, Harvard Medical School and Peter Bent Brigham Hospital, Boston.

The character behaves as a simple Mendelian dominant with equal chance among the offspring of affected individuals that it will be or will not be inherited.

17. *The Relative Stimulating Efficiency of Spectral Colors for the Lower Organisms*: S. O. MAST, Zoological Laboratory, Johns Hopkins University.

The stimulation in all of the organisms studied depends upon the wave-length of the light, and the stimulating efficiency is very much higher in certain regions of the spectrum than in others, but the regions differ in certain organisms closely related in structure.

18. *The Mission Range, Montana*: W. M. DAVIS, Department of Geology, Harvard University.

This range seems unique in its systematic tripartite arrangement of normally and glacially sculptured forms.

19. *Definition of Limit in General Integral Analysis*: ELIAKIM HASTINGS MOORE, Department of Mathematics, University of Chicago.

The definition is noteworthy in that it involves no metric features of the range  $\mathfrak{P}$  underlying the range of definition of the function  $F(\sigma)$ .

This number of the *Proceedings* contains also a notice of the memoir by Charles C. Adams on "The Variations and Ecological Distribution of the Snails of the Genus *Io*"; the Report of the Autumn Meeting, and the Index and Table of Contents of the complete volume, including a list of the officers and members of the academy.

We may summarize the articles in Volume 1 of the *Proceedings* as follows: Mathematics, 21; Astronomy, 31; Physics, 7; Chemistry, 21; Geology and Paleontology, including Mineralogy and Petrology, 10; Botany, 4 (see also Genetics); Zoology, 15 (see also Genetics); Genetics, 17; Physiology and Pathology, including Bacteriology, 24; Anthropology, 12; Psychology, 3; a total of 165 articles.

The division of these articles between members of the academy and non-members is 55 and 110, respectively.

The list of institutions which have contributed three or more articles is as follows: Carnegie Institution 34, divided as follows: Solar Observatory 17, Nutrition Laboratory 9, Station for Experimental Evolution 5, Marine Biology 2, Geophysical Laboratory 1; University of Chicago 20; University of California 17; Harvard University 16; Johns Hopkins University 11; Rockefeller Institute 11; University of Illinois 8; Yale University 6; Princeton University 5; Smithsonian Institution 4; U. S. National Museum 4; Stanford University 4; American Museum of Natural History 4; U. S. Geological Survey 3.

EDWIN BIDWELL WILSON

#### RECENT PROGRESS IN VERTEBRATE PALEONTOLOGY

THREE years ago the Paleontological Society of America published a symposium, the purpose of which was to present a review of the progress made during the preceding decade in paleontology. Since 1911 there have been published in the American Year Book brief summaries of the more important results of investigation in this field throughout successive years. The extreme brevity of these reviews has rendered them less useful to students than

might have been the case had they been accompanied by critical notes, or had they been prepared with the same fulness as Dr. Lydekker's valuable discussions in *Science Progress* for the last few years. It is hoped that the following account of the year's achievements in the field of vertebrate paleontology may, in a measure, supply the deficiency which has heretofore existed.

*Fishes*.—Owing to the stress of conditions abroad, it is natural that the chief advance in vertebrate paleontology since the war began should have been made in this country. Nevertheless, several very important contributions by foreign authors are to be recorded. Among the latter may be mentioned Dr. A. S. Woodward's generalizations on the evolutionary history of the class of fishes, as contained in his anniversary address before the Geological Society of London (February 19, 1915). The net result of this author's observations is thus formulated:

Each successive great group of fishes began with free-swimming fusiform animals. . . . Some of them always passed quickly into slow-moving (deep-bodied or grovelling, depressed and large-headed) types, while others changed more slowly into elongated or eel-shaped types. There was also a constant tendency for the primitive symmetry of the parts of the skeleton in successive members of a group to become marred by various more or less irregular fusions, suppressions and subdivisions. Finally, some of the successive species of each group gradually increased in bodily size until the maximum was reached, just before the time for extinction had arrived. These and many other more special changes have now been traced in a general way in each group, and the various geological periods at which they occurred have been determined by observations on fossil fishes from many parts of the world.

Professor F. Priem, of Paris, presents a valuable account of the Cretaceous and Eocene fishes of Egypt,<sup>1</sup> and has continued his studies on Upper Tertiary fish remains from southwestern France.<sup>2</sup> Dr. Edward Hennig, of the Berlin Museum, reports the interesting discovery of otoliths in the type species of *Palæo-*

*niscus*, from the Permian of Saxony. A note on the parasphenoid bone of the same genus, by Henry Day,<sup>3</sup> contains observations which lead the author to conclude "in favor of a primitive Teleostome, and against a Dipnoan, derivation of the Tetrapoda." African fossil fishes form the subject of two contributions by Edward Hennig,<sup>4</sup> and a further one by Ernst Stromer von Reichenbach,<sup>5</sup> of Munich.

In this country Dr. R. L. Moodie,<sup>6</sup> of the University of Illinois, has reinvestigated the fossilized brain-structure and auditory organs of a small Palæoniscid species, *Rhadinichthys deani*, first described by Eastman and Parker from specimens found in the Waverly of Kentucky. Similar remains are also reported from the Caney shale of Oklahoma, and the Pennsylvanian of Lawrence, Kansas. The same author also reviews the literature relating to fossil brain casts of dinosaurs and other extinct animals. Some additions to our knowledge of the Jurassic fish-fauna of Solenhofen and Cerin, France, are made by C. R. Eastman in his studies of Carnegie Museum material.<sup>7</sup>

Dr. W. K. Gregory,<sup>8</sup> of the American Museum of Natural History, presents a concise review of the evolutionary history of the principal groups of fishes, with special reference to the skull and locomotor organs. He brings together considerable evidence for the view that certain of the Devonian Crossopterygii were related to the four-footed terrestrial vertebrates, and attempts to trace the gradations by which the pectoral and pelvic fins of these fishes were transformed into the fore and hind limbs of the earliest amphibians.

<sup>3</sup> *Ann. Mag. Nat. Hist.*, Vol. 16, pp. 421-434.

<sup>4</sup> *Archiv. f. Biontologie*, Vol. 3, pp. 291-312. This is on fish remains obtained by the Tendaguru expedition. The second paper, on *Semionotus* from South Africa, is published in the *Sitzber. Ges. Naturf. Freunde Berlin*, 1915, pp. 49-51.

<sup>5</sup> *Zeitschr. Deutsch. Geol. Ges.*, Vol. 66, pp. 420-425.

<sup>6</sup> *Jour. Compar. Neurology*, Vol. 25, No. 2.

<sup>7</sup> *Mem. Car. Mus.*, Vol. 6, Nos. 6, 7.

<sup>8</sup> *Annals N. Y. Acad. Sci.*, Vol. 26, pp. 317-383, pl. IV.

<sup>1</sup> *Bull. Soc. Geol. France*, Vol. 14, pp. 366-382, pl. X.

<sup>2</sup> *Ibid.*, pp. 119-131; 249-278.

*Amphibians*.—Professor S. W. Williston,<sup>9</sup> of the University of Chicago, in his discussion of the genus *Trimerorachis*, from the Permian of Texas and Oklahoma, argues that this interesting animal, which is in some respects more fish-like than any other known amphibian, represents a secondary adaptation to aquatic habits, and that its ancestors were more terrestrial, and therefore less pisciform in structure and habits. Dr. Carl Wiman,<sup>10</sup> of Upsala, has published an important memoir on the abundant Stegocephalians of the Trias of Spitzbergen, which, as remarked by Broili, were probably marine animals.

Dr. F. Broili,<sup>11</sup> of Munich, contributes an interesting discussion of *Tanystrophæus conspicuus* von Meyer from the Muschelkalk of Bayreuth, an animal known from certain excessively elongate caudal vertebrae. The author adopts as most probable Cope's sagacious determination of these strange vertebrae as representing a small Theropodous dinosaur, an opinion also adopted by Baron von Huene.

Dr. R. L. Moodie<sup>12</sup> describes a remarkable amphibian from the Pennsylvanian of Ohio which combines early amphibian and reptilian characters in the limbs. The same author, in describing the scales of certain Carboniferous amphibians<sup>13</sup> comments on their resemblances to and differences from the scales of fishes. In the *Kansas University Science Bulletin* Dr. Moodie gives a list of the described species of fossil amphibians, comprising more than 300 entries. Again, in the September number of the *American Naturalist*, the same author contrasts the amphibians of the Coal Measures with their supposed relatives among fringe-finned ganoids, and shows that even at that remote period the Amphibia and Crossopterygii were structurally far removed from each other; so that their common ancestors, if any such existed, must be sought in some much earlier period.

Professor E. C. Case, of the University of Michigan, contributes an important memoir on the Permo-Carboniferous Red Beds of North America and their Vertebrate Fauna.<sup>14</sup> He describes the geological structure and relations of these beds, the character of the environment, and discusses the life habits and appearance of many of the fossil amphibians and reptiles found there, giving restorations of a score of these strange creatures.

*Reptiles*.—Dr. R. Broom, of London, has prepared an illustrated catalogue of the Permian Triassic and Jurassic reptiles of South Africa.<sup>15</sup> This collection was made by Dr. Broom in South Africa and purchased from him by the American Museum of Natural History; it includes a large series of skulls and partial skeletons, representing many genera and families of the mammal-like reptiles (Therapsida). The same author in his Croonian lecture on the Origin of Mammals<sup>16</sup> discusses the anatomical evidence for the derivation of the mammals from one or another of the Therapsid group, especially the earlier Cynodontia, which are the most mammal-like of all the South African reptiles.

D. M. S. Watson, of University College, London, in the *Proceedings of the Zoological Society of London*, December, 1914, describes and analyzes the skull structure of *Bauria*, *Microgomphodon*, *Arctops* and other important South African Permian types. These researches are all in harmony with the now widely held view that the mammals have arisen from some of these mammal-like reptiles, but the connecting links have not yet been discovered. In another paper<sup>17</sup> Watson describes the anatomy of the Deinocephalia, one of the most curious of the South African groups. Some of these animals were of huge size, with massive limbs and an arched back, like a gigantic *Echidna*, but with a swollen, short-beaked skull.

<sup>9</sup> *Jour. Geol.*, Vol. 23, pp. 246-255.

<sup>10</sup> *Bull. Geol. Inst. Upsala*, Vol. 13, 9 plates and 10 figs.

<sup>11</sup> *Neues Jahrb. Mineral.*, Jahrg. 1915, Vol. 2.

<sup>12</sup> *Amer. Jour. Sci.*, Vol. 29.

<sup>13</sup> *SCIENCE*, March 26, 1915.

<sup>14</sup> Carnegie Inst. Washington, Pub. No. 207.

<sup>15</sup> *Bull. Amer. Mus. Nat. Hist.*, Vol. 25, Part 2.

<sup>16</sup> *Phil. Trans. Roy. Soc. London*, 1914, Vol. 206 B.

<sup>17</sup> *Proc. Zool. Soc. London*, September, 1914.

Mr. Watson has also described<sup>18</sup> a peculiar Permian South African reptile named by Seeley *Eunotosaurus africanus*, which appears to give the long-sought clue to the origin of the Chelonia. The turtles and tortoises, it will be remembered, are the only vertebrates in which the pelvis and shoulder-girdle have been drawn inward under the expanded and projecting ribs. In *Eunotosaurus*, the ribs are expanded and of the same number as in the Chelonia, while the back was armored with dermal scutes of similar number and position; but the shoulder-girdle and pelvis still retain their primitive positions and the skull also retained teeth, which are lost in the Chelonia.

In this connection must be recorded a work by Professor Hugo Fuchs, of Strassburg, on the structure and development of the skull of *Chelone imbricata*, the first part of which, on the cartilage skull and visceral arches, is a quarto of 325 pages, 6 plates and 182 text figures (Stuttgart, 1915). Here are discussed many far-reaching morphological questions such as the derivation of the lateral wings of the sphenoid bone and the origin of the mammalian auditory ossicles.

The latter subject, after nearly a century of discussion, has of late years received special illumination from the investigations of Professor Gaupp, of Freiburg, who has ably supported Reichert's view that the mammalian incus has been derived from the reptilian quadrate, the malleus from the articular. Reichert's theory has encountered certain objections based upon supposed differences in the position of the auditory ossicles with reference to the hyoidean gill slit and to the chorda tympani nerve in reptiles, birds and mammals. Mr. E. S. Goodrich, of Merton College, Oxford, has definitely cleared up this intricate matter in a superb series of figures showing the developmental relations of the chorda tympani in the different classes of vertebrates. His results lend very strong support to Reichert's theory.<sup>19</sup>

In a memoir entitled "Triassic Life of the

<sup>18</sup> *Proc. Zool. Soc. London*, December, 1914.

<sup>19</sup> *Quarterly Journal of Microscopical Science*, 1915.

Connecticut Valley"<sup>20</sup> Professor R. S. Lull, of Yale University, gives a highly readable biological and geological account of the Connecticut Valley during the Triassic Period and of its teeming inhabitants, especially the dinosaurs. The later dinosaurs have been the subject of important contributions by several American authors whose papers may be noted as follows:

Mr. C. W. Gilmore,<sup>21</sup> of the U. S. National Museum, has given a very thorough and well illustrated description of the osteology of *Stegosaurus* based upon the skeleton and other specimens in the U. S. National Museum. Briefer notices by the same author<sup>22</sup> are upon the restoration of *Stegosaurus* and upon the fore-limb of *Allosaurus*, the latter settling a problem that had been a standing annoyance and cause of confusion in dinosaur paleontology of the last thirty years.

Dr. W. J. Holland<sup>23</sup> has published some preliminary results of his researches upon the magnificent series of Sauropodous dinosaurs secured in Utah by Mr. Earl Douglass for the Carnegie Museum. He finds that the skull referred by Marsh to *Brontosaurus* is probably wrongly collated, the true skull of this genus being much nearer the *Diplodocus* type. The tail of *Brontosaurus* he finds, like that of *Diplodocus*, ends in a long slender whip-lash and is at least ten feet longer than the published reconstructions have indicated.

Mr. Barnum Brown and Lawrence M. Lambe have published a number of highly important articles descriptive of the magnificent series of dinosaur skulls and skeletons obtained from the Cretaceous of Alberta by Mr. Brown for the American Museum of Natural History and by Mr. Sternberg for the Victoria Museum in Ottawa, Canada.

Dr. Edward Hennig,<sup>24</sup> of the Berlin Mu-

<sup>20</sup> Bulletin No. 24, State Geol. and Nat. Hist. Survey Connecticut.

<sup>21</sup> *Bull. U. S. Nat. Mus.*, No. 89, December 31, 1914, p. 147.

<sup>22</sup> *Proc. U. S. Nat. Mus.*, 1915, Vol. 49, pp. 355-356, pl. 52; *ibid.*, pp. 501-513.

<sup>23</sup> *Annals Carnegie Mus.*, Vol. IX., pp. 273-278.

<sup>24</sup> *Sitzber. Ges. Naturf. Fr. Berlin*, 1915, pp. 203-247.

seum, has described and figured various skeletal bones of the new armored dinosaur whose remains are found in great numbers in the Tendaguru dinosaur quarries of German East Africa. He points out its marked differences from *Stegosaurus*, compares it more slightly with the European genera *Omosaurus*, *Polacanthus*, etc., and describes it as new under the (unfortunately preoccupied) name of *Kentrosaurus*.

A handbook on Dinosaurs by Dr. W. D. Matthew published by the American Museum of Natural History describes and illustrates the principal exhibits in this museum and discusses their characteristics, and the place in nature occupied by this extinct order of reptiles.

*Mammals*.—Progress in this branch of vertebrate paleontology during the past year has been mainly in continuance of researches, presenting few salient points of interest. The most important contributions of the year on fossil mammals deal with the order Primates, and there should be mentioned first of all those relating to primitive man. In our own language three books have appeared during the year which treat of prehistoric human remains; of these the foremost place must be accorded to Professor Henry Fairfield Osborn's "Men of the Old Stone Age," which presents in accurate and very interesting style the latest results of scientific research upon the environment, habits and art on paleolithic man. "The Antiquity of Man," by Mr. Arthur Keith, sets forth with admirable lucidity and literary style the somewhat extreme views of its distinguished author upon the great antiquity of the modern types of man and his early divergence from the remaining primate stems. The third volume, "Prehistoric Man and His Story," by Dr. Scott Elliott, includes excellent photographs of the remarkable series of statuettes representing primitive and ancestral types of man executed under direction of Professor Rutot. It can not be said to rank with the two first-mentioned books in authority, the

Tertiary paleontology and American archeology being especially weak.

A most important contribution has been added by Gerritt S. Miller<sup>25</sup> to the controversy that has raged around the famous Piltdown skull. Dr. Miller analyzes with care the evidence for and against the association of the skull fragments with the lower jaw and compares the latter with a large series of chimpanzee jaws in the National Museum. He comes to the conclusion that the jaw is in every respect within the limits of individual variation of the chimpanzees, and displays no distinctively human characters, while the skull fragments display in every particular the characters of the genus *Homo*. Not only is there an entire lack of blending of these two distinct types of skull, but in such parts as should show coordinated characters and adjustment of one to the other, such conformity is wholly lacking.

In the present reviewer's opinion [W. D. M.] Dr. Miller's argument is convincing and irrefutable; the jaw belonged to a chimpanzee and the skull to a species of man comparable with that represented by the Heidelberg jaw. It is hardly to be expected, however, that this conclusion will be readily accepted by the European writers, who have with but few exceptions committed themselves more or less deeply to the opposite view.

It is quite true, as Professor Boule has observed, that nature affords many instances of unexpected combinations of different types, and no one need be surprised to see an ape-like dentition combined with a man-like brain-case. Indeed, Elliott Smith has adduced excellent reasons why we may well expect to find such a combination. But it is necessary here to distinguish between the concepts of resemblance and identity. The Piltdown jaw is *not* simply a jaw similar in adaptive specialization to that of an ape, it is a jaw identical with that of the chimpanzee in every particular. The skull is not merely similar in brain-case to that of man, it is the skull of *Homo* in every particular. For such a combination as this, with its

<sup>25</sup> *Smithson. Misc. Coll.*, Vol. 65, No. 12.

utter lack of blending, correlation or coordination of interrelated parts, one set of fragments identical with one, the other set identical with another animal of diverse type, not merely similar each to each—such a combination is without parallel and is not reasonably possible. To cite a familiar instance, the teeth of the chalicotheres have a general adaptive resemblance to the titanotheres, the skull and neck to the horses, the claws to the edentates. This is a combination quite unexpected, but nevertheless a quite possible one, and of course well proven. But if one should find a jaw identical in every particular with that of a titanother associated with a cranium identical in every way with that of *Equus* and claw-phalanges agreeing in all respects with *Mylodon*, it would not be reasonably possible that they could belong to a single animal, no matter what arguments of association and distribution were adduced to support such a conclusion.

Turning to mammals exclusive of man, we may note first a paper by Dr. Guy E. Pilgrim,<sup>26</sup> of the Geological Survey of India, in which are described a number of new or little-known anthropoids from the Miocene and Pliocene of India. The author discusses the affinities of the higher primates and the ancestry of man in the light of the new evidence and regards the extinct genus *Sivapithecus* as very near to the direct ancestry of man. *Pithecanthropus* he considers to be approximately intermediate, while the Piltdown man (*Eoanthropus*) and Neanderthal man (*Homo neanderthalensis*) are relegated to a side branch derived from an earlier stage in the ancestral series than *Sivapithecus*. Pilgrim's conclusions in regard to other extinct and existing genera are no less unexpected. Among the living anthropoids the gibbon is considered nearest to the hominid stem. One species of the Miocene *Dryopithecus* is believed to be related to the gorilla, and the new genus *Palæosimia* to the orang. Pilgrim's views are criticized by W. K. Gregory.<sup>27</sup>

The well-known anthropologist Professor

<sup>26</sup> *Records Geol. Surv. India*, Vol. 45, pp. 1-74; 4 pls. and 2 figs.

<sup>27</sup> *SCIENCE*, Vol. 43, pp. 341-342.

Gustav Schwalbe<sup>28</sup> of Strassburg contributes an extended description of *Oreopithecus* and a conservative discussion of the affinities of this ape of the European Miocene.

Dr. W. K. Gregory<sup>29</sup> summarizes his studies on the lemuroid Primates and discusses the evolution and relationships of the lemuroids of the Eocene of North America and Europe. A significant feature in this author's classification is the association of all the living and extinct lemurs of Madagascar, in spite of their diversity of form and size, in a single group, more primitive than the African and Oriental lemuroids, and nearly related to the Eocene *Adapis* and *Notharctus* of Europe and North America. The African bush-baby (*Galago*) and East Indian loris (*Nycticebus*) are more progressive types, the tarsier (*Tarsius*), although still grouped with the Lemuroidea, in many respects approaches the higher primates. The group of small Eocene primates known as Anaptomorphidæ are now included under the Tarsiidæ; *Necrolemur* of the French Oligocene is related to *Tarsius* and *Galago*, but, with *Microchærus*, is held in a distinct family.

The conclusions just enumerated, based upon anatomical grounds, have a most important bearing upon the evolutionary history and dispersal of the primates. That Madagascar has served as a refuge for primitive survivals of a group once widespread is not surprising. That the diversity of the Malagasy primates covers an underlying near affinity points to their derivation from a single stock, not from the remnants of a diverse lemuroid fauna of the adjoining continents.

Dr. W. D. Matthew and Mr. Walter Granger<sup>30</sup> describe a series of new or little known primates and primate-like Insectivora from the North American Eocene and trace the history of these groups through the successive horizons of the Eocene. In the best known group of these Eocene lemuroids, the

<sup>28</sup> *Zeitsch. f. Morph. Anthr.*, Vol. 19, pp. 149-254.

<sup>29</sup> *Bull. Geol. Soc. Amer.*, December, 1915.

<sup>30</sup> *Bull. Amer. Mus. Nat. Hist.*, Vol. 33, Part I., Carnivora, W. D. M.; Parts II. and III., Condylarthra, W. D. M. and W. G.; Part IV., Primates, etc., W. D. M.

Notharctidae, the evolution of the teeth is traced through a series of minute gradations from the base of the true Eocene to its upper levels. A restudy of the famous "*Anaptomorphus*" skull, with newly discovered referred material shows that it is a distinct genus from the lower jaw upon which this genus was originally founded; the dentition of several other genera of this group is described chiefly on new material, and all are referred to the same family as the modern tarsier. Two other groups, imperfectly known and of doubtful affinities, the Microsyopidae and Apatemyidae, are retained in the Insectivora, but their primate resemblances pointed out.

The above-mentioned papers add largely to the data for reconstructing the evolutionary history of the order primates, including man, a line of investigation that is being actively followed. The latest results of researches upon the "Piltdown Man" (*Eoanthropus*) are summarized in the British Museum Guide to the Fossil Remains of Man.

An interesting announcement by Matthew and Granger in the paper above cited is of the discovery of a relative (*Arctostylops*) of the peculiar Notoungulates of South America in the North American Eocene. These extinct hoofed animals were abundant in the Tertiary of South America, but were supposed to be wholly limited to that continent. Although this announcement rests solely upon the evidence of a lower jaw, the pattern of the premolar and molar teeth is so characteristically like the Notoungulate type and so unlike any other that it is regarded as reasonably certain.

Other sections of the same revision cover the Condylarthra (*Phenacodus*, *Ectocion*, *Meniscotherium*, *Hyopsodus*, etc.) and the primitive Carnivora or Creodonta. The true distinctive characters of the genera and species of these groups, based upon far larger collections than had been previously known, are described, several new genera and many new species described, and the exact geologic horizon and range of each species is specified. The affinities of each species to those of earlier and later horizons are discussed, and the materials and evidence brought together for a faunal and

phylogenetic final chapter when the revision has been completed.

The skeleton of *Myotragus*, a remarkable type of antelope discovered in the Pleistocene caves of the Balearic Islands by Miss Dorothea Bate is described by Dr. C. W. Andrews<sup>31</sup> of the British Museum of Natural History. It is allied to the rupicaprine antelopes, but distinguished by a single pair of much-enlarged rodent-like incisor teeth. From the later Tertiaries of California Professor J. C. Merriam,<sup>32</sup> of the University of California, describes various new three-toed horses and other mammals, and Dr. O. P. Hay,<sup>33</sup> of the U. S. National Museum, describes a skull of the rare and peculiar Sirenian *Desmostylus*. Dr. Hay has also published several valuable contributions on American Pleistocene mammals, especially of Iowa.<sup>34</sup> From the Pliocene of Nebraska, Professor E. H. Barbour,<sup>35</sup> of the University of Nebraska, has secured a number of new proboscidean skeletons and skulls, adding largely to our knowledge of this interesting group. Mr. H. J. Cook,<sup>36</sup> of Agate, Nebraska, and Dr. W. J. Sinclair,<sup>37</sup> of Princeton University, also describe a number of new Pliocene mammals from Nebraska, including a remarkable antelope with scimitar-shaped horns. From the basal Eocene of Montana Mr. J. W. Gidley,<sup>38</sup> of the U. S. National Museum, describes a lower jaw referred to the Myrmecobiidae or banded anteaters of Australia.

<sup>31</sup> *Phil. Trans. Roy. Soc. London*, Vol. 206, B, pp. 281-305, 4 pls.

<sup>32</sup> "New Protohippine Horses" and other titles in *Bulletins* of Dept. Geology, Univ. California; *Popular Science Monthly*, March, 1915, pp. 245-264.

<sup>33</sup> *Proc. U. S. Nat. Mus.*, Vol. 49, pp. 381-397, 3 pls.

<sup>34</sup> *Ann. Report Iowa Geol. Surv.*, Vol. 23, pp. 1-506, 75 pls. *Proc. U. S. Nat. Mus.*, Vol. 48, pp. 515-575, 7 pls.

<sup>35</sup> *State Journal*, Lincoln, Neb., January 3, 1915.

<sup>36</sup> Four articles in *Rep. Nebraska Geol. Survey*, Volumes 4 and 7.

<sup>37</sup> *Proc. Amer. Phil. Soc.*, Vol. 54, pp. 73-95.

<sup>38</sup> *Proc. U. S. Nat. Mus.*, Vol. 48, pp. 395-402, pl. XXIII.



[In the reviewer's opinion this jaw agrees in most of its characteristic features with the Leptictidae, a family of Insectivora, and the single feature of resemblance to *Myrmecobius*, the relative height of inner and outer trigonid cusps is by no means sufficient evidence for relationship to the marsupials. The tooth considered by Mr. Gidley to be the first molar appears to the reviewer to be clearly a fourth premolar, as it is set deeper in the jaw and less worn than the tooth behind it, belongs therefore to the successional series or premolars, not to the first series of cheek teeth (milk and true molars), and is characteristically like the fourth premolar of all the Leptictid genera, especially that of an undescribed genus from the Paleocene (Torrejon formation). The skull and skeleton characters of *Myrmecobius* are, on the other hand, in near agreement throughout with the polyprotodont marsupials, and wholly at variance with Gidley's conclusion of an independent parallel evolution of the group from pre-Tertiary ancestors. W. D. M.]

An important monograph by Professor H. Winge,<sup>39</sup> of Copenhagen, upon the Edentata of the Pleistocene of Brazil includes an authoritative systematic revision of the order, and critical notes of great interest.

Dr. O. Abel, of Vienna, has published a small but richly illustrated book entitled "Die vorzeitlichen Säugetiere." American fossil mammals are exceptionally well represented.

Under the title of "Climate and Evolution" Dr. W. D. Matthew,<sup>40</sup> of the American Museum of Natural History, presents a theory accounting for the observed geographical distribution of animals in present and past ages. He begins by applying to the facts certain modern geological doctrines, such as the correlated alternations of elevation and of climate during geological time, the isostatic balance of continental and ocean masses, and the persistence of the great continental masses which never sank to abyssal depths, but often permitted the sea to make temporary incursions

upon their surfaces. Partly by means of a remarkable series of maps, showing the present and past distribution of many races of mammals, the author adduces very weighty evidence for the view that these races originated in the northern continents and then spread southward into South America, Africa, southeastern Asia and Australia.

Professor H. F. Osborn,<sup>41</sup> of the American Museum of Natural History, contributes to the American Naturalist an extended study of certain features of the process of evolution. Basing his conclusions on a wide range of zoological, experimental and paleontological data, he develops the distinction between "rectigradations," or qualitatively and numerically new characters and "allometrons," or changes in proportion, degree or intensity.

The same author<sup>42</sup> summarizes the successive advances and retreats of the continental glaciers and the corresponding shiftings of the floras, faunas and human populations. The special feature of this paper is the demonstration that in Europe, as in America, the so-called "warm fauna" survives until the advance of the fourth glaciation. The last topic is more fully treated in Professor Osborn's recently published work entitled "Men of the Old Stone Age." Here the author gives a detailed description and analysis of the long series of Paleolithic stages in Europe, with a series of new restorations of *Pithecanthropus*, of *Eoanthropus* and of the Races of Neanderthal and Crô-Magnon.

C. R. EASTMAN,  
W. K. GREGORY,  
W. D. MATTHEW

### SPECIAL ARTICLES

#### A PHOMA DISEASE OF WESTERN WHEAT-GRASS

WESTERN wheat-grass, *Agropyron smithii* Rydb. is a very important forage plant in many of the pastures in the Salt Lake Valley,

<sup>41</sup> *American Naturalist*, Vol. 49, April, 1915, pp. 193-239.

<sup>42</sup> "Revision of the Pleistocene of Europe, Asia and Northern Africa," *Annals N. Y. Acad. Sci.*, July, 1915.

<sup>39</sup> "Aftryk af 'E Museo Lundii' Köbenhavn," 1915.

<sup>40</sup> *Annals N. Y. Acad. Sci.*, Vol. 24, 1915.